

WHAT IS CLAIMED IS:

1. A chemical treatment method by which a metal film formed on a material to be subjected to film formation is etched into a predetermined pattern,
5 comprising:

a cathode electrolysis reduction step of performing electrolysis reduction for the metal film as a cathode by using one of a first acidic treatment solution containing an acid radical and an alkaline treatment solution containing a halogen ion; and
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an acid dip step of dipping the metal film into a second acidic treatment solution after the cathode electrolysis reduction step.

2. A method according to claim 1, wherein the first acidic treatment solution is one member selected from the group consisting of hydrochloric acid, sulfuric acid, carboxylic acid, hydrogen fluoride, and phosphoric acid.
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3. A method according to claim 1, wherein the halogen ion is one member selected from the group consisting of sodium chloride, potassium chloride, and potassium iodide.
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4. A method according to claim 1, wherein the second acidic treatment solution contains a halogen ion.
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5. A chemical treatment method by which a metal film formed on a material to be subjected to film

formation is etched into a predetermined pattern, comprising:

5 a cathode electrolysis reduction step of performing electrolysis reduction for the metal film as a cathode by using a treatment solution containing a halogen ion; and

an acid dip step of dipping the metal film into an acidic treatment solution after the cathode electrolysis reduction step.

10 6. A method according to claim 5, wherein the acidic treatment solution contains a halogen ion.

7. A method according to any one of claims 4 to 6, wherein the halogen ion is a chloride ion.

15 8. A method according to any one of claims 1 to 6, wherein the cathode electrolysis reduction step comprises dipping a portion of the metal film into a treatment solution containing a halogen ion.

20 9. A method according to claim 8, wherein a metal forming the metal film is one metal selected from the group consisting of chromium, titanium, tungsten, palladium, and molybdenum.

25 10. A method according to claim 8, wherein a metal forming the metal film is an alloy containing at least one of chromium, titanium, tungsten, palladium, and molybdenum.

11. A chemical treatment method by which a metal film formed on a material to be subjected to film

formation is etched into a predetermined pattern,
wherein the metal film is dipped in an acidic
treatment solution containing a halogen ion, and
electrolysis reduction is performed for the metal film
5 as a cathode.

12. A method according to any one of claims 1 to 5
and 11, wherein a metal forming the metal film is one
metal selected from the group consisting of chromium,
titanium, tungsten, palladium, and molybdenum.

10 13. A method according to any one of claims 1 to 5
and 11, wherein a metal forming the metal film is an
alloy containing at least one of chromium, titanium,
tungsten, palladium, and molybdenum.

15 14. A method according to claim 11, wherein the
halogen ion is a chloride ion.

15 15. A chemical treatment apparatus by which
a metal film formed on a material to be subjected to
film formation is etched into a predetermined pattern,
comprising:

20 a cathode electrolysis reduction device which
performs an electrolysis reduction treatment for the
metal film as a cathode by using one of a first acidic
treatment solution containing an acid radical and
an alkaline treatment solution containing a halogen
25 ion; and

an acid dip device which dips the metal film into
a second acidic treatment solution after the

electrolysis reduction treatment is performed by the cathode electrolysis reduction device.

16. A chemical treatment apparatus by which a metal film formed on a material to be subjected to film formation is etched into a predetermined pattern, comprising an electrolysis device which dips the metal film into an acidic treatment solution containing a halogen ion, and performs an electrolysis reduction treatment for the metal film as a cathode.

10 17. An apparatus according to claim 15 or 16, wherein the halogen ion is a chloride ion.

15 18. An apparatus according to claim 15 or 16, wherein in the electrolysis reduction treatment, a portion of the metal film is dipped in a treatment solution containing one of a halogen ion and an acid radical.

19. An apparatus according to claim 18, wherein the halogen ion is a chloride ion.

20 20. An apparatus according to claim 18, wherein a metal forming the metal film is one metal selected from the group consisting of chromium, titanium, tungsten, palladium, and molybdenum.

25 21. An apparatus according to claim 18, wherein a metal forming the metal film is an alloy containing at least one of chromium, titanium, tungsten, palladium, and molybdenum.

22. An apparatus according to claim 15 or 16,

wherein a metal forming the metal film is one metal selected from the group consisting of chromium, titanium, tungsten, palladium, and molybdenum.

23. An apparatus according to claim 15 or 16,
5 wherein a metal forming the metal film is an alloy containing at least one of chromium, titanium, tungsten, palladium, and molybdenum.